

ARKANSAS CORN and GRAIN SORGHUM BOARD PROGRESS REPORT FOR 2008 FIELD SEASON

Can Arkansas Corn Growers Use A Chlorophyll Meter to Improve Nitrogen Use Efficiency?

Investigator: Morteza Mozaffari, Assistant Professor, Director U of A of Marianna Soil Testing and Research Laboratory

Cooperator: Jason Kelly, Extension Agronomist, Wheat and Feed Grains

BACKGROUND INFORMATION

This project will evaluate the chlorophyll meter (CM) as a decision-aid tool for in-season application of nitrogen (N) fertilizer and predicting corn yields. The growers will benefit from development and availability of a new, rapid, and reliable tool that will enable them to apply N only when there is a likelihood of an increase in corn yield and profit margins. The Minolta chlorophyll meter (CM) is an easy-to-use, affordable, handheld spectrophotometer, that is capable of measuring an index of plant chlorophyll content, which is related to plant N content. The 2008 cropping season was the second year of this three year project. Field studies were conducted to evaluate the effect of N application rate on leaf chlorophyll content, leaf N and corn grain yield.

EXPERIMENTAL PROCEDURES

Field experiments were conducted at five locations in Arkansas on commercial corn producers' fields and University of Arkansas Agricultural Experiment Station Research Farms. Before application of any treatments, soil samples were collected from the 0- to 6-inch depth at each site and composited by replicate. Plots were 25-ft long and 4-rows wide. The experimental design was a randomized complete block with six total N rates and four replications of each treatment. Nitrogen fertilizer was pre-plant applied and incorporated with Do-all.

Chlorophyll meter (CM) data were collected with a Minolta SPAD 502 CM at two to three growth stages (V6 to pre tassel) from the newest fully expanded leaf that has a visible leaf collar. (Table 2). Analysis of variance (ANOVA) was performed using the GLM procedure of SAS to evaluate the effect of N application rate on corn grain yield and leaf CM. Sites were analyzed separately. Mean separations were performed by the Waller Duncan minimum significant difference (MSD) test at significance levels of 0.10.

2008 RESULTS

Soil texture in the 0-to 6-inch depth was silt loam (14-28 % clay), soil pH ranged from 6.1 - 6.8 Table 2. and preplant soil NO₃-N ranged from 8 to 70 ppm. Application of N significantly increased grain yield and leaf chlorophyll content. Corn grain yield for the 0 N plots ranged from 38 to 127 bu/acre and 174-271 bu/acre for plots treated with 300 lb N/acre. Chlorophyll content of corn leaves in the 0 N plots was 27 to 47 SPAD units. In general yield and leaf chlorophyll content increased as the N application increased and maximum yield was produced by application of 240 to 300 lb N/acre. We are currently working on the analysis of grain samples. We will continue this research for another year to collect additional data for evaluating the feasibility of using a chlorophyll meter to fine tune in-season N application to corn. At the end of the project we will use the data to evaluate 1) the relationship between chlorophyll meter readings and corn grain yield, and nitrogen uptake, 2) the relationship between chlorophyll meter readings and optimum N rate, and 3) the most suitable corn growth stage(s) for using the chlorophyll meter as a diagnostic tool.